

Table 1: Plant composition of five alpine habitat types recognized in the Pamir region. (Based on collections made in Tulibai Valley, Big Pamir Wildlife Reserve.

| <u>Plant Species</u> | <u>Sedge Meadows</u> | <u>Alpine Steppes</u> | <u>Rubble Slopes and Scree</u> | <u>Alpine Heaths</u> | <u>Gulleys</u> |
|-----------------------------------|----------------------|-----------------------|--------------------------------|----------------------|----------------|
| <u>Acantholimon diapensioides</u> | | + | x | | |
| <u>Acantholimon gilli</u> | | + | x | | |
| <u>Artemisia cf. rutaefolia</u> | | + | x | | |
| <u>Astragalus neubauerianus</u> | | x | | | |
| <u>Cousinia sp.</u> | | x | x | | |
| <u>Ephedra sp.</u> | | x | x | | |
| <u>Oryzopsis sp.</u> | | x | | | x |
| <u>Oxytropis sp.</u> | | | x | | |
| <u>Psychrogeton sp.</u> | | x | x | | |
| <u>Arenaria sp.</u> | | + | x | | |
| <u>Aster heterochaete</u> | | | x | x | |
| <u>Cerastium sp.</u> | x | | x | x | |
| <u>Chorispora macropoda</u> | | | x | x | |
| <u>Cicer sp.</u> | | | | | x |
| <u>Delphinium brunonianum</u> | | x | x | x | x |
| <u>Epilobium latifolium</u> | | | | | x |
| <u>Gentiana sp.</u> | x | | | x | |
| <u>Hedysarum cephalotes</u> | | + | x | | x |
| <u>Nepeta pamirense</u> | | x | x | | x |
| <u>Oxyria digynia</u> | | | | | x |
| <u>Pedicularis sp.</u> | x | | | | x |
| <u>Polygonum sp.</u> | x | | x | x | |
| <u>Potentilla gelida</u> | | | x | | |
| <u>Potentilla sericea</u> | | + | x | | |

| <u>Plant Species</u> | <u>Sedge Meadows</u> | <u>Alpine Steppes</u> | <u>Rubble Slopes and Scree</u> | <u>Alpine Heaths</u> | <u>Gulleys</u> |
|---|--------------------------|---------------------------|------------------------------------|--------------------------|----------------|
| <u>Primula macrophylla</u> | x | | x | + | |
| <u>Ranunculus rufosepalus</u> | | | x | | |
| <u>Saussurea gnaphaloides</u> | | | x | x | |
| <u>Saxifraga hirculus</u> var <u>alpina</u> | | | x | x | |
| <u>Saxifraga</u> sp. | | | x | + | |
| <u>Sedum heterodontum</u> | | x | | | x |
| <u>Sedum</u> sp. | x | | | + | |
| <u>Senecio</u> sp. | | x | | | x |
| <u>Smelowskia calycina</u> | | x | x | | x |
| <u>Spathipappus griffithi</u> | | | x | | x |
| <u>Tanacetum</u> sp. | | x | x | | |
| <u>Waldheimia</u> sp. | | | | x | |
| <u>Ziziphora clinopodioides</u> | | x | x | | x |
| <u>Carex</u> sp. | + | x | x | x | x |
| <u>Colpodium villosum</u> | | | x | | |
| <u>Festuca</u> sp. | x | + | x | x | x |
| <u>Kobresia</u> sp. | + | x | x | + | x |
| <u>Taeniatherum crinitum</u> | | x | x | | x |
| <u>Trisetum spicatum</u> | | | x | | |
| <u>Poaceae</u> | + | x | x | x | x |

(Key: + = dominant species; x = other species present)



Figure 15. Streamside shrub community along the Wakhan River near the village of Ab Gaj (elevation 2800 m). Note the six Bactrian camels resting on the river flat.

The dominant plants in the two habitats defined as rubble slopes and scree, and gulleys could not be specified because of the extreme variability in plant composition within these two zones. Additionally, a sixth major habitat type occurred in the valley bottoms of the Wakhan and Pamir rivers which was best developed below 3100 m elevation. Lying outside the area of major investigations, it is nevertheless mentioned as an important habitat for many of the bird species observed in the Wakhan Corridor. Unlike the alpine region, it has a well-developed shrub layer dominated by a sometimes dense growth of sea buckthorn (Hippophae rhamnoides), with willow (Salix sp.) and some tamarisk (Myricaria germanica). The ground layer is made up of a variety of species which include representatives of the family Poaceae, as well as Astragalus, Artemisia, Potentilla, Nepeta, and Epilobium, among others (Figure 15).

It should be mentioned that a few ancient juniper (Juniperus sp.) stands can still be found on the xeric slopes below Langar, above the Wakhan River at elevations of over 3100 m. Similar remnants of former widespread forests were also found in Nuristan (FAO, 1978, Project Field Document No. 9) and because of over-exploitation have nearly become extinct. This habitat merges with the alpine steppes described previously.

Intensive grazing pressure (i.e., observations of plants grazed down to their base), combined with the unusually low percent of vegetation cover in habitats studied in the Small Pamir during the winter 1974-75, led Skogland and Petocz (1975) to believe that those habitats have been extensively altered by overgrazing. This matter will be discussed more fully in Parts 2 and 3 of this report.

3.2. Fauna

3.2.1. Mammals: The most spectacular mammal in the region is the ungulate species for which the reserve system in the Pamir has been established, the Marco Polo sheep (Ovis ammon poli). Part 2 of this report is focused on

the biology of these wild sheep. In addition, 13 other mammals have been observed in the Pamir region, and four additional species were reported by Naumann and Niethammer (1973), and Naumann and Nogge (1973). Table 2 summarizes mammals thus far reported from the Wakhan Corridor.

Table 2. Mammalian fauna of the Wakhan Corridor.

| | | | | |
|---------|-------------------|-----------------------------|-----------------------|-----------------------|
| Order: | CARNIVORA | | Observed by Petocz | Reported by others |
| Family: | <u>Felidae</u> | | | |
| | Snow leopard | <u>Panthera pardus</u> | X | X |
| | Lynx | <u>Lynx lynx</u> | X | X |
| | <u>Canidae</u> | | | |
| | Wolf | <u>Canis lupis</u> | X | X |
| | Red fox | <u>Vulpes vulpes</u> | | |
| | <u>Mustelidae</u> | | | |
| | Stone marten | <u>Martes foina</u> | | X |
| | Ermine | <u>Mustela ermina</u> | X | X |
| | Common otter | <u>Lutra lutra</u> | X | X |
| | <u>Ursidae</u> | | | |
| | Brown bear | <u>Ursus arctos</u> | X | X |
| Order: | ARTIODACTYLA | | | |
| Family: | <u>Bovidae</u> | | | |
| | Marco Polo sheep | <u>Ovis ammon poli</u> | X | X |
| | Siberian ibex | <u>Capra ibex sibericus</u> | X | X |

| | | | |
|---------|---|-------------------------------|-----------------------|
| Order: | INSECTIVORA | Observed by Petocz | Reported by others |
| Family: | <u>Soricidae</u> | | |
| | Common European white- toothed shrew | <u>Crocidura russala</u> | X |
| Order: | LAGOMORPHA | | |
| Family: | <u>Leporidae</u> | | |
| | Cape hare | <u>Lepus capensis</u> | X |
| | <u>Ochotonidae</u> | | |
| | Large-eared pika | <u>Ochotona macrotis</u> | X |
| Order: | RODENTIA | | |
| Family: | <u>Sciuridae</u> | | |
| | Long-tailed marmot | <u>Marmota caudata</u> | X |
| | <u>Muridae</u> | | |
| | Field mouse | <u>Apodemus sylvaticus</u> | X |
| Family: | <u>Cricetidae</u> | | |
| | Grey hamster | <u>Cricetulus migratorius</u> | X |
| | Mountain vole | <u>Alticola roylei</u> | X |
| | Pamir vole | <u>Microtus juldaschi</u> | X |

Observations include those made over a six-year period, from 1971 to 1976. For other reports see: Kullmann (1968/69); Naumann and Niethammer (1973); Naumann and Nogge (1973); Hassinger (1970); and FAO (1977, Project Field Document No. 1).

The Siberian ibex (Capra ibex sibericus) is distributed throughout the Wakhan Corridor including the section of the Hindu Kush mountains which lies south of the Wakhan River. A partial census is available for the population, which is presented in Table 3. The total number of animals observed, however, is believed to represent a fraction of the entire population in the Wakhan. Considerably more work need be carried out on the ibex before any conclusions can be drawn about annual allowable harvests in the Reserve and elsewhere in the region. Information on ibex habitat behavior may be found in FAO, 1978, Project Field Document No. 6.

Table 3. Partial census of Siberian ibex in the Afghan Pamir.

| | Males | Females | Sub-adults | Undiff. | Total |
|-------------|-------|---------|------------|---------|-------|
| Big Pamir | | | | | |
| 1971 | 143 | 20 | 7 | 40 | 210 |
| 1972 | 363 | 77 | 82 | 165 | 687 |
| 1973 | 19 | 3 | - | - | 22 |
| Small Pamir | | | | | |
| 1972 | 11 | 13 | 10 | - | 34 |
| 1973 | 57 | 12 | 9 | - | 78 |
| 1974-5 | 20 | 93 | 29 | 348 | 490 |

NB. The Waghjir Valley and Hindu Kush mountains are excluded from the above figures.

Because of their uncertain and probably threatened status, the snow leopard and lynx have been recommended for complete protection in Afghanistan (FAO, 1977, Project Field Document No. 2). As solitary carnivores, they are seldom seen but are hunted for their fur whenever the occasion arises. The snow leopard in particular is considered dangerous to domestic stock and the locals tell many stories of attempted or successful predation by these cats. The brown bear, while not an endangered species, is rare in the Pamir and permits are no longer issued by the Afghan Tourist Organization to harvest this species. Wolves are common, and especially in winter can be seen almost daily, usually as singles or in pairs. They prey on Marco Polo sheep and ibex as well as domestic stock, a subject which is discussed in Part 2 of this report. Up to five wolves have been observed in packs in the Small Pamir but locals have reported them in packs of ten or more. One or two individuals have been observed moving among yak herds near camps, but wolves will not disturb larger domestic animals unless three or four individuals are present. Red fox and ermine, although shy animals, have been seen stalking smaller rodents and pikas. Cape hares are common and occur most frequently along the interface area of mountain slopes and valley bottoms. The reddish-brown, long-tailed marmots are everywhere present in the Pamir and favor valley bottoms or slope breaks where they form small colonies. They are occasionally pursued by local people for their furs which have a good trade value in the bazaars of Badakhshan and Kunduz. The hibernation period begins around 15 September and may last until May if snow cover is present. Stone marten and otter occur along the Pamir and Wakhan rivers but do not extend beyond these habitat areas, and are not observed frequently. The rodents, particularly the vole species, appear plentiful and, excluding marmots, are drawn to temporary human habitations where they take advantage of ready food supplies.

Naumann and Niethammer (1973) have pointed out similarities in the fauna of the Afghan and Russian Pamir. The reader is referred to the above paper for a summary of the ecology of these species.

3.2.2. Birds: One hundred seventeen species of birds have thus far been recognized in the Pamir area including the Wakhan Valley, and for convenience have been listed in Appendix I. In addition to observations made by project staff over the last six years, the identifications of Neithammer (1973) and Nogge (1973) have been included in the appendix. The avifauna shows little influence by the Indian subcontinent. Thus far 14 species are known to breed in the Pamir area and include Himalayan snowcock (Tetraogallus himalayensis), chukar (Alectoris chukar), shore lark (Eremophila alpestris), house martin (Delichon urbica), white wagtail (Motacilla alba), brown accentor (Prunella fulvescens), wheatear (Oenanthe oenanthe), desert wheatear (O. deserti) Guldenstadt's redstart (Phoenicurus erythrogaster), redstart (P. phoenicurus), bluethroat (Luscinia svecica), snowfinch (Montifringilla nivalis), chough (Pyrrhocorax pyrrhocorax) and the rare bar-headed goose (Anser indicus). However, it is thought that as much as 30% of the species present breed in the Wakhan. The Wakhan Corridor lies in the path of a major flyway that sees numerous migratory waterfowl en route to and from their breeding areas in Soviet Central Asia and Siberia through the Corridor and across the Hindu Kush mountains to points south in the Seistan and coastal Iran, or in a more eastward direction towards India. Huge flights of common crane (Grus grus) have been observed over the Aksu Valley in the Small Pamir in early September while hundreds of waterfowl such as mallard (Anas platyrhynchos), teal (A. crecca), wigeon (A. penelope), pintail (A. acuta) and coot (Fulica atra) were observed resting at the Chaqmatin Lake in late September and October. Ducks have also been seen on lakes in the valley heads of the Big Pamir Wildlife Reserve and on Zor Kol on the Russian frontier. It is possible that the very endangered Siberian crane (Grus leucogeranus) may also rest briefly in the Corridor en route to its breeding grounds on the Ob River in Siberia. Although migrating waterfowl are not hunted on Lake Chaqmatin, the eggs of bar-headed geese and nesting ducks are collected by Kirghiz people whenever they are found. The lammergeier (Gypaetus barbatus), an endangered species in many parts of its former world range, occurs commonly throughout the Pamir as does the Egyptian vulture (Neophron percnopterus) and Griffon vulture (Gyps fulvus). These three

scavengers, together with the steppe eagle (Aquila rapax), enjoy a symbiotic relationship with wolves, and in the Pamir area depend largely on wolf kills for food. Lesser kestrels (Falco naumanni) can frequently be observed in hunting groups of 3 to 5 birds preying on Lepidoptera that feed on plants in the alpine steppes and sedge meadows. The Himalayan snowcock, already mentioned as a breeding bird in the Pamir, may be observed in large coveys of more than 25 birds. They have been seen foraging along with nursery groups of Marco Polo sheep and often arouse the curiosity of young lambs who follow them closely in a playful manner. Choughs have been observed perched atop Marco Polo sheep or ibex, picking the external parasites from the ungulates. They are nicely tolerated, and it is usual for the recipient to stand motionless while the birds preen their body trunk and head region. Although few warblers (Sylviidae) are listed in Appendix I, several more species probably occur, particularly in the shrubland habitat along the Wakhan River.

In winter, many species vacate the Pamir region for more southerly nesting areas. Skogland and Petocz (1975) identified only 34 species from November 1974 through January 1975 which is probably a fairly accurate reflection of winter residents.

3.2.3. Amphibians, Reptiles and Fish: The herpetofauna of the Pamir region has been neglected by investigators up to the present day. The high elevations of the Pamir preclude an abundance or diversity of amphibians and reptiles. This factor, coupled with the general inaccessibility of the area, has made the Wakhan Corridor unattractive to research. However, collections and observations have been made in eastern Badakhshan between the provincial capital at Faizabad up to the village of Qazi Deh which lies about 60 kms from Qala-i-Panja where the Wakhan River joins the Pamir River at 2850 m elevation (Anderson and Leviton, 1969; Leviton and Anderson, 1970; and Ueno and Nakamura, 1966). It is these two river valleys that hold most of the herpetofauna of the Corridor.

The toad (Bufo viridis), an extremely widespread species in Europe and Asia and also known to occur up to elevations of 4700 m in the Himalayas (Leviton and Anderson, 1970), was found up to elevations of only 3750 m. Rana ridibunda ridibunda, the true frog, and another widespread species, was observed only along the Wakhan River in the Corridor, but was reported earlier from Badakhshan at localities in Ishkashem (Ueno and Nakamura, 1966) and Zebak (Anderson and Leviton, 1969). Petocz (1976, pers. obs.) also recorded the presence of both these amphibians along the Sanglech River, from Zebak to Bande-i-Tahana, and in Nuristan (FAO, 1977, Project Field Document No. 9). Two agamid lizards were also observed above the Wakhan Valley. Agama badakhshana, a new species first described by Anderson and Leviton (1969) from material collected by the Street Expedition in 1965 from Mazar-i-Sharif, and recorded from Badakhshan from a locality 64 miles east of Faizabad, and the more common A. himalayana himalayana were found up to elevations of 3500 m above the Wakhan River. The latter was identified by Anderson and Leviton (1969) from material collected about 20 kms east of Ishkashem (85 kms west of Qala-i-Panja). Petocz (1976, pers. obs.) also observed both species in Badakhshan in several localities above the Sanglech River. Eremias nigrocellata was identified by Anderson and Leviton (1969) near Zebak and Petocz (1976, pers. obs.) has likewise seen this lizard in the Sanglech area and above the village of Sargaz in the Wakhan at about 3100 m. Geckos appeared absent, although they were not searched for in the Wakhan; it remains to be proven whether Cyrtodactylus caspius is found further east of the Zebak area. A single species of snake (Eryx tataricus) was also identified by Anderson and Leviton (1969) near Zebak but almost certainly does not occur nearer to the Pamir region, although it is otherwise widespread at lower elevations in central Asia.

There has been no work accomplished on the fish which occur in the Wakhan Corridor. Fish species have been observed in the Wakhan, Pamir and Aksu rivers as well as the Lakes Kolo Chaqmatin and Zor Kol. They have also been found in drainage systems of Aich Killee Valley in the Small Pamir,

1 INTRODUCTION

This report is the first of a three-part investigation on the Afghan Pamir. Part 2, The Biology of Marco Polo Sheep, and Part 3, A Management Plan for the Big Pamir Wildlife Reserve, have been published in Kabul simultaneously as Project AFG/74/016 Field Documents, numbers 6 and 7. Collectively they represent a synthesis of five seasons of field work in the area between 1971 and 1976.

Government interest in the Pamir region was enlivened with the establishment of a lucrative hunting programme for the Marco Polo sheep. Since the initial studies by Caughley (1970), Petocz (1971, 1973A, 1973B, 1973C) and Skogland and Petocz (1975) the area has been increased, although not yet formally published in the Official Government Gazette, and the hunting programme has been improved and expanded. Largely because of the economic potential of the hunting programme, Government requested this project to thoroughly investigate the wild sheep population and regional ecology of the area with a view to expanding tourism in this remote region of Badakhshan which would help to integrate local peoples into the economy of the province. The first part of this report series is an attempt to summarize major ecological aspects of the Wakhan Corridor which includes both the Big and Small Pamirs. It is designed largely as an inventory to acquaint the reader with present conditions in the region and describe the outstanding characteristics of this very unique part of Afghanistan.



Figure 16. A major site of petroglyphs in the Waghjir Valley (elevation ca. 4150 m).
Many of the older petroglyphs have been damaged by new etchings.

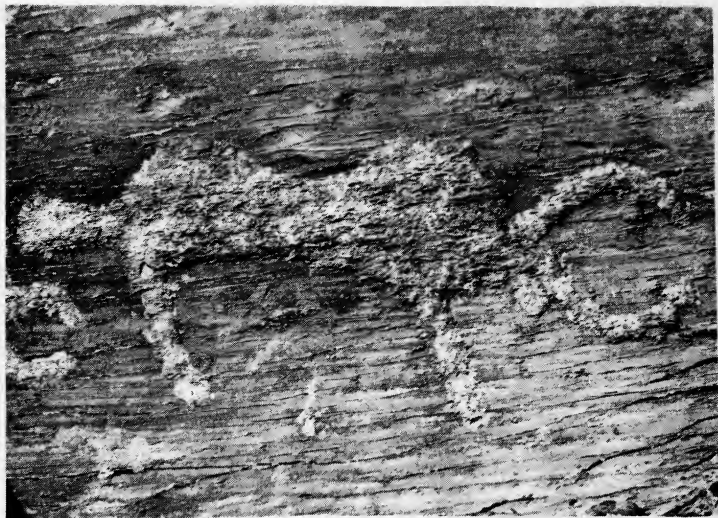


Figure 17. Petroglyph from the Waghjir Valley site depicting a wild yak (length of the animal is about 90 mm).

and Alisu Valley adjacent to the Big Pamir Reserve up to an elevation of 4200 m. All are believed to be carp species and may be related to forms found in other localities in eastern Afghanistan, from the families Siluridae and Cyprinidae reported previously by Kullmann (1970).

4. CULTURAL RESOURCES

4.1. Archaeology

The Afghan Pamir contains some valuable archaeological sites, most of which have not been reported before. Noticeable mounds containing boulder outlines of dwelling foundations were discovered in 1972 at the mouth of Andemin Valley in the Small Pamir. Kirghiz residents claim to have found bronze projectile points while digging below the surface near the foundation. Further eastward, the remains of an ancient cemetery were accidentally located by Kirghiz at the mouth of (small) Tas Seri Valley when they were setting up their winter quarters some years ago. Several long bones have been extracted but no metallic or clay relics have yet been unearthed.

A large granite boulder with petroglyphs depicting men astride horses hunting wild yak with bows and arrows was first described by Naumann (1973) from a locality in the Wakhan Valley. These petroglyphs were believed to be pre-Islamic. Additional petroglyphs have been discovered at two sites near the mouth of Aq Jelga in the Small Pamir. Two previously unreported petroglyph sites were discovered by the author in the Waghjir Valley in 1973 (Figure 16). Both sites contain an array of human and animal figures which are inscribed in bedrock, in one case shale and the other, an undetermined igneous rock. These petroglyphs are unquestionably the most artistic and beautifully preserved of their kind so far discovered in the Afghan Pamir. Most of the representations are small, ranging in size from about 8 cm² to 160 cm² for any individual in a given "painting." Some figures are of a single object, such as a wild yak or ibex (Figure 17); others are more diverse, depicting hunting scenes with human figures holding bows and arrows,



Figure 18. Petroglyph from the Waghjir Valley site depicting human figures with three-pronged spears in pursuit of an ibex. Length of the animal is about 150 mm. Compare the difference of style with that in Figure 17.

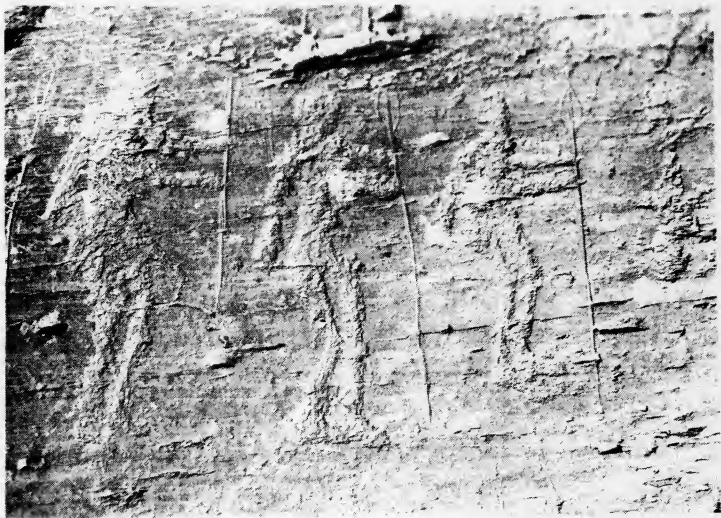


Figure 19. Enlargement of the hunters shown in Figure 18.



Figure 20. Old Kirghiz graves (gumbaz) at Qabrestani Ortobil in the Aksu Valley, Small Pamir (elevation ca. 4100 m).

or war parties such as the one shown in Figures 18 and 19 showing a line of human figures holding three-pronged spears. An analysis of this material is being made and will be published in the future (Petocz, in prep.).

Worth mentioning are the numerous cemetery localities containing gumbaz or Kirghiz graves. These house-like structures resemble small igloos or yurts, many of which date back more than 200 years, according to local informants (Figure 20). The best sites observed in the Small Pamir were located in the Aksu Valley at the junction of the Andemin, Tas Seri, Qabrestani-Ortobil and Chelab tributaries. The most famous site mentioned by Curzon (1896) is located at the mouth of the Waghjir Valley and is called Bozai Gumbaz. Additional sites were reported from the Big Pamir but were not visited. The remains of a probable Chinese grave marker, a stone structure about 10 meters high, occur along the main trail above the Wakhan River below the Aq Beles Pass. However, local residents did not seem to know anything of its origin.

The above information clearly indicates human utilization of this area centuries ago. The Waghjir Pass which drops into Sinkiang Province of China, the Teger Mensu Valley at the junction of Afghanistan, China and the USSR, the Boroghil Pass south of the village of Sarhad in the Big Pamir which leads to Chitral, and the numerous passes crossing over into the Soviet Union from the Small Pamir (e.g., Andemin, Ortobil, Jaman Sor, to mention a few), have made the Afghan Pamir one of history's great crossroads and migration routes for travellers. Although Curzon (1896) insists that Kirghiz people then did not inhabit the area, evidence points to at least seasonal use of the Pamir pastureland. The wild yaks of the Pamir have since become domesticated but undoubtedly roamed the lush sedge meadows of these alpine areas perhaps as recently as the latter part of the nineteenth century (Shaw, 1871.).

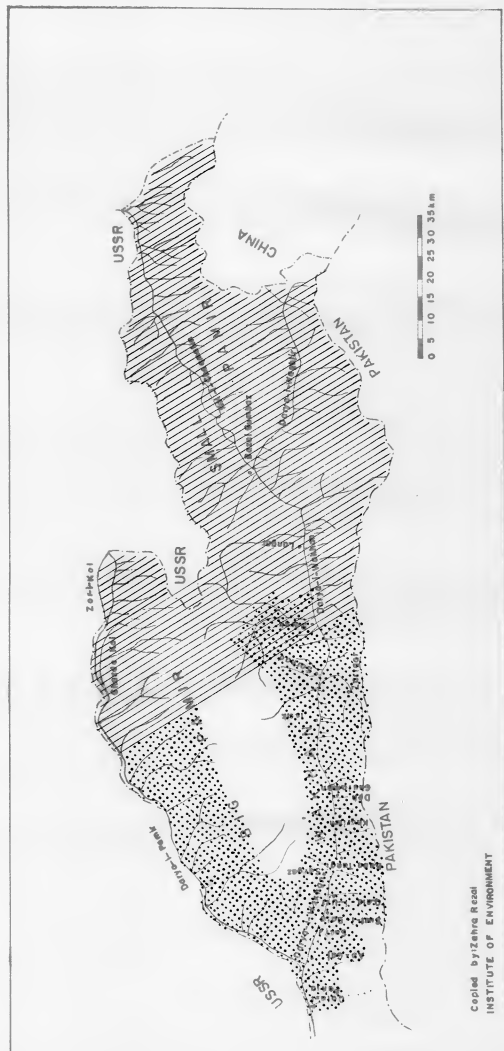


Figure 21. Division of the traditional territories of Wakhiz and Kirghiz people in the Afghan Pamir. Legend : ▨ - Wakhiz territory ; ▤ - Kirghiz territory.

4.2. Present Human Environment

Two ethnic groups currently occupy the Wakhan and divide the whole of the Corridor in half. The Wakhis, a group of probably mixed origin, are dispersed along most of the eastern and northern parts of Badakhshan. In the Wakhan, they have established permanent villages along the Wakhan River up to Sarhad with about 4,000 inhabitants (Figure 21). In the spring and summer months, part of the population moves into the mountain of the Big Pamir to graze yaks, sheep and goats in high alpine pastures. To my knowledge, there is only one Wakhi encampment (aylok) of not more than 10 people maintained in the Big Pamir through the winter, located in Alisu Valley. The Wakhi people are both agricultural and pastoral, and in the Wakhan Valley raise crops of wheat, barley and peas in limited areas of cultivation near village sites. Other travellers have commented on their poor condition (Wood, 1941, and Shor, 1955) which stems from their oppressive economic condition intensified by widespread opium addiction.

The Mongol Kirghiz people occupy all of the Small Pamir and a large section of the Big Pamir (Figure 21). There are probably not more than 2,000 inhabitants, all of whom are pastoral. No crops are grown in the valley of the Pamir River because of the high elevation, although the Wakhis have managed to grow wheat at Langar in the Wakhan Valley at an elevation of 3640 m. The Kirghiz are governed by an ancient tribal feudal system headed by one khan or chieftain who resides in the Small Pamir. The majority of the people are poor and make a living by pasturing animals belonging to their wealthy peers. Besides their diet of dairy products, wheat is also an important staple. Trade is carried on with the Wakhis throughout most of the year. They must journey to the county seat at Khundud to acquire necessities such as salt, sugar and tea, or become completely dependent upon peddlers who visit the region in the summertime. Some of the wealthy Kirghiz have acquired land formerly belonging to Wakhis in the Wakhan Valley and use the local residents to farm their wheat.

The present-day relationship between these two societies is probably an innovation that arose when open trade between bordering countries ended. Now it is only by accident that someone might stray from Afghan territory across a neighboring frontier at which time an issue is made of the event. The lack of any movement to and from the area, particularly among the Kirghiz, has compelled these residents to adapt to their restricted situation. For more background on the people of the Wakhan, the reader is referred to Shahrani (1976).

REFERENCES

- Anderson, S.C. and A.E. Leviton, 1969 - Amphibians and reptiles collected by the Street Expedition to Afghanistan, 1965. Proc. California Academy of Sciences. 4th series, 37(2): 25-56.
- Breckle, S.W., 1971 - Vegetation in alpine regions of Afghanistan. Pp. 107-116, in Plant Life of South-West Asia. Botanical Soc. of Edinburgh, Aberdeen University Press.
- Caughley, G., 1970 - Report to the Government of Afghanistan on wildlife resources. FAO/UNDP (report) TA 2905. Rome.
- Curzon, G.N., 1896 - The Pamirs and the source of the Oxus. Bull. Royal Geographical Society, London.
- FAO, 1977 - The mammals of Afghanistan: Their distribution and status. Prepared by K. Habibi. Project Field Document Nol 1 FO:DP/AFG/74/016.
- FAO, 1978 - An ecological reconnaissance of western Nuristan with recommendations for management. Prepared by R.G. Petocz and J.Y. Larsson. Project Field Document No. 9 FO:DP/AFG/74/016.
- Freitag, H., 1971 - Studies in the natural vegetation of Afghanistan. Pp. 89-106, in Plant Life of South-West Asia. Botanical Soc. of Edinburgh, Aberdeen University Press.
- Hassinger, J.D., 1970 - A Survey of the Mammals of Afghanistan. Chicago Field Museum of Natural History. Vol. 60.
- Komroff, E., 1926 (ed.) - The Travels of Marco Polo. Random House, New York.

- Kullmann, E., 1968 - Expedition in die Heimat der Marco Polo Sheep
Ein Beitrag über die Tierwelt des Afghanistan. Freunde des
Kölner Zoo, 11: 107-122.
- Kullmann, E., 1970 - Die tierwelt Ostafghanistans in ihren geographischen
Beziehungen. Freunde des Kölner Zoo. 14 3-25.
- Leviton, A.E. and S.C. Anderson, 1970 - The amphibians and reptiles of
Afghanistan, a checklist and key to the herpetofauna. Proc.
California Academy of Sciences, 4th series. 38(10):163-206.
- Matthews Jr. J.V., 1975 - Arctic Steppe - an extinct biome. Terrain
Sciences Division, Geological Survey of Canada, Ottawa.
Unpublished manuscript.
- Naumann, C., 1973 - Ein ehemaliges Wildyak-vorkommen im afghanischen
Pamir. Bonn. Zool. Beitr. 24:249-253.
- Naumann, C. and J. Niethammer, 1973 - Zur Säugetierfauna des afghanischen
Pamir und des Wakhan. Bonn Zool. Beitr. 24:237-248.
- Naumann, C. and G. Nogge, 1973 - Die Grosssäuger Afghanistans. Zeitschrift
des Kölner Zoo. 3:79-93.
- Petocz, R.G., 1973A - Marco Polo Sheep (Ovis ammon poli) of the Afghan
Pamir: A report of biological investigations in 1972-1973.
Report to the Government of Afghanistan.

- Petocz, R.G., 1973B - Progress report number 1 (AFG/72/005): Conservation and utilization of wildlife resources. Report to the Government of Afghanistan.
- Petocz, R.G., 1973C - Reorganization and improvement of the Marco Polo sheep hunting programme. Report to the Government of Afghanistan.
- Shahrani, M.N.M., 1976 -- Kirghiz pastoral nomads of the Afghan Pamirs: a study in ecological and intra-cultural adaptation. PhD thesis. University Microfilms, Ann Arbor, Michigan., order number 77-620.
- Shaw, R.B., 1871 - Visit to High Tartary, Yarkand, and Kashgar and return journey over the Karakorum Pass. John Murray, London.
- Shor, J.B., 1955 - After You, Marco Polo. McGraw-Hill Book Co., New York.
- Skogland, T. and R.G. Petocz, 1975 - Ecology and behavior of Marco Polo sheep (Ovis ammon poli) in the Pamir during winter. Report to the Government of Afghanistan.
- Ueno, S. and K. Nakamura, 1966 - The anurans collected by the Kyoto University Pamir Hindu Kush Expedition, 1960. Results Kyoto University Scientific Expedition Karakoram Hindukush.
- Wood, J., 1941 - Source of the River Oxus. Blackwood and Sons, London.

Appendix I: Birds of the Wakhan Valley and the Afghan Pamir

| | | Wakhan Valley | Big Pamir | Small Pamir |
|------------------------------------|------------------------------|------------------|--------------|----------------|
| <u>Herons, Egrets and Bitterns</u> | <u>Ardeidae</u> | | | |
| Grey Heron | <u>Ardea cinerea</u> | | | X |
| <u>Swans, Geese and Ducks</u> | <u>Anatidae</u> | | | |
| Bar-Headed Goose | <u>Anser indicus</u> | | X | X |
| Ruddy Shelduck | <u>Tadorna ferruginea</u> | X | | X |
| Mallard | <u>Anas platyrhynchos</u> | X | X | X |
| Wigeon | <u>Anas penelope</u> | | X | X |
| Teal | <u>Anas crecca</u> | | X | X |
| Pintail | <u>Anas acuta</u> | | X | X |
| Shoveler | <u>Anas clypeata</u> | | X | X |
| Goosander | <u>Mergus merganser</u> | X | | X |
| <u>Eagles, Hawks and Allies</u> | <u>Accipitridae</u> | | | |
| Buzzard | <u>Buteo buteo</u> | | X | |
| Long-Legged Buzzard | <u>Buteo rufinus</u> | | X | |
| Golden Eagle | <u>Aquila chrysaetos</u> | X | X | X |
| Steppe Eagle | <u>Aquila rapax</u> | | X | X |
| Egyptian Vulture | <u>Neophron percnopterus</u> | X | X | X |
| Lammergeier | <u>Gypaetus barbatus</u> | X | X | X |
| Griffon Vulture | <u>Gyps fulvus</u> | X | X | X |
| <u>Falcons</u> | <u>Falconidae</u> | | | |
| Gyr Falcon | <u>Falco rusticolus</u> | | | X |
| Saker Falcon | <u>Falco cherrug</u> | | | X |
| Merlin | <u>Falco columbarius</u> | | X | |
| Lesser Kestrel | <u>Falco naumanni</u> | | X | X |
| Kestrel | <u>Falco tinnunculus</u> | X | X | X |
| Laggar Falcon | <u>Falco juggar</u> | | X | |

| | | Wakhan Valley | Big Pamir | Small Pamir |
|--------------------------------|----------------------------------|------------------|--------------|----------------|
| <u>Pheasant Family</u> | <u>Phasianidae</u> | | | |
| Himalayan Snowcock | <u>Tetraogallus himalayensis</u> | X | X | X |
| Chukar | <u>Alectoris chukar</u> | X | X | X |
| <u>Cranes</u> | <u>Gruidae</u> | | | |
| Crane | <u>Grus grus</u> | | X | X |
| <u>Rails, Crakes and Coots</u> | <u>Rallidae</u> | | | |
| Coot | <u>Fulica atra</u> | | X | X |
| <u>Avocets</u> | <u>Recurvirostridae</u> | | | |
| Black-Winged Stilt | <u>Himantopus himantopus</u> | | | X |
| <u>Plovers</u> | <u>Charadriidae</u> | | | |
| Little Ringed Plover | <u>Charadrius hiaticula</u> | X | | X |
| Lesser Sandplover | <u>Charadrius mongolus</u> | | | X |
| Lapwing | <u>Vanellus vanellus</u> | X | | |
| <u>Sandpipers and Snipe</u> | <u>Scolopacidae</u> | | | |
| Little Stint | <u>Calidris minuta</u> | | | X |
| Redshank | <u>Tringa totanus euruinus</u> | X | X | X |
| Greenshank | <u>Tringa nebularia</u> | | | X |
| Common Sandpiper | <u>Tringa hypoleucos</u> | | X | X |
| Wood Sandpiper | <u>Tringa glareola</u> | X | | |
| Snipe | <u>Gallinago gallinago</u> | | X | |
| <u>Phalaropes</u> | <u>Phalaropodidae</u> | | | |
| Red-Necked Phalarope | <u>Phalaropus lobatus</u> | | | X |

| | | Wakhan Valley | Big Pamir | Small Pamir |
|--------------------------|--------------------------------|------------------|--------------|----------------|
| <u>Gulls and Terns</u> | <u>Laridae</u> | | | |
| Gull (?) | <u>Larus</u> | | X | X |
| Great Black-Headed Gull | <u>Larus ichthyaetus</u> | | X | |
| Common Tern | <u>Sterna hirundo</u> | | X | X |
| <u>Sandgrouse</u> | <u>Pteroclididae</u> | | | |
| Pallas's Sandgrouse | <u>Syrrhaptes paradoxus</u> | | | X |
| <u>Pigeons and Doves</u> | <u>Columbidae</u> | | | |
| Rock Dove | <u>Columba livia</u> | X | X | |
| Snow Pigeon | <u>Columba leuconota</u> | X | | |
| Turtle Dove | <u>Streptopelia turtur</u> | X | | |
| Rufous Turtle Dove | <u>Streptopelia orientalis</u> | X | X | |
| Eastern Stock Dove | <u>Columba eversmanni</u> | X | | X |
| <u>Owls</u> | <u>Strigidae</u> | | | |
| Eagle Owl | <u>Bubo bubo</u> | | X | X |
| Bruce's Scops Owl | <u>Otus brucei</u> | X | X | |
| Little Owl | <u>Athene noctua</u> | X | | |
| <u>Cuckoos</u> | <u>Cuculidae</u> | | | |
| Cuckoo | <u>Cuculus canorus</u> | X | | |
| <u>Nightjars</u> | <u>Caprimulgidae</u> | | | |
| Nightjar | <u>Caprimulgus europaeus</u> | X | X | |
| <u>Swifts</u> | <u>Apodidae</u> | | | |
| Swift | <u>Apus apus</u> | X | X | X |
| Alpine Swift | <u>Apus melba</u> | X | | |
| <u>Rollers</u> | <u>Coraciidae</u> | | | |
| Roller | <u>Coracias garrulus</u> | X | X | |

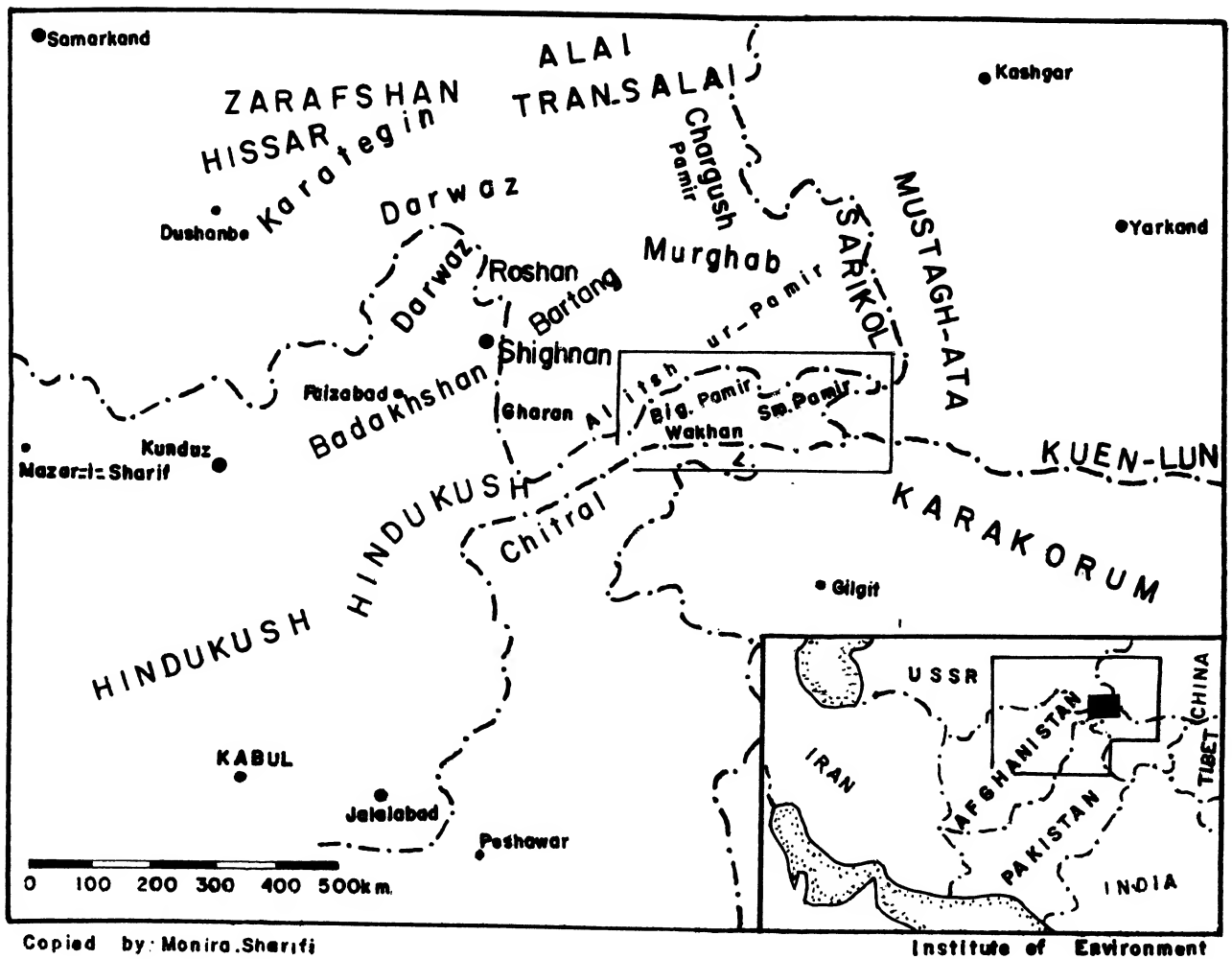


Figure 1. Location map of the Wakhan Corridor and Pamir Mountains
(modified after Naumann and Neithammer, 1973).

2. THE PHYSICAL ENVIRONMENT

2.1. Location

The Afghan Pamir is situated in the north-eastern panhandle of Afghanistan, in an area known today as the Wakhan Corridor (Figure 1). Originally created as a buffer zone between British India and Tsarist Russia in 1895-96, the Wakhan Corridor is today bordered by the USSR in the north, Sinkiang Province of China in the east, and Gilgit and Chitral provinces of Pakistan in the south. The Wakhan River, with its source waters in the glaciers of the Waghjir Valley, separates mountains of the Hindu Kush lying to the south from the main Pamir region. From Wakhan, the Hindu Kush mountains continue eastward where they eventually merge with the Karakorum Range of Pakistan and Kashmir. These mountains adjoin the main Himalayan chain which continues into Kashmir, Tibet, Nepal, Sikkim and Bhutan. North of the Darya Wakhan lies the Big Pamir. It occupies the western portion of the Corridor between the Pamir and Wakhan rivers and extends eastward where it ends near the Bozai Gumbaz and Waghjir rivers. Eastward from this junction lies the Small Pamir. It includes the wide plain of the Aksu Valley with the mountainous fringes that skirt the frontiers of the Soviet Union and China.

2.2. Physiography

Towards the end of the last century, G.N. Curzon, a British explorer famed for discovering the source waters of the Oxus River, set down a definition for the term "Pamir" which with little modification is acceptable today. He stated, "... a Pamir ... is ... a mountain valley of glacial formation, differing only from adjacent or other mountain valleys in its superior altitude, and in the greater degree to which its trough has been filled up by glacial detritus and alluvium, and has thereby approximated in appearance to a plain owing to the inability of the central stream to scour for itself a deeper channel; this

| | | Wakhan Valley | Big Pamir | Small Pamir |
|----------------------------|-----------------------------|------------------|--------------|----------------|
| <u>Hoopoe</u> | <u>Upupidae</u> | | | |
| Hoopoe | <u>Upupa epops</u> | X | X | X |
| <u>Woodpeckers</u> | <u>Picidae</u> | | | |
| Wryneck | <u>Jynx torquilla</u> | X | | |
| <u>Larks</u> | <u>Alaudidae</u> | | | |
| Shore Lark | <u>Tremophila alpestris</u> | X | X | X |
| Small Skylark | <u>Alauda gulgula</u> | X | | |
| Crested Lark | <u>Galerida cristata</u> | | X | |
| <u>Swallows and Martin</u> | <u>Hirundinidae</u> | | | |
| Swallow | <u>Hirundo rustica</u> | X | X | X |
| Crag Martin | <u>Hirundo rupestris</u> | X | X | X |
| House Martin | <u>Delichon urbica</u> | X | X | X |
| <u>Pipits and Wagtails</u> | <u>Motacillidae</u> | | | |
| Meadow Pipit | <u>Anthus pratensis</u> | | X | |
| Water Pipit | <u>Anthus spinoletta</u> | | X | |
| Olive-Backed Pipit | <u>Anthus hodgsoni</u> | X | | |
| White Wagtail | <u>Motacilla alba</u> | X | X | X |
| Grey Wagtail | <u>Motacilla cinerea</u> | | X | X |
| Yellow Wagtail | <u>Motacilla flava</u> | | X | X |
| Citrine Wagtail | <u>Motacilla citreola</u> | X | X | X |
| <u>Shrikes</u> | <u>Laniidae</u> | | | |
| Lesser Grey Shrike | <u>Lanius minor</u> | | X | |
| Red-Backed Shrike | <u>Lanius collurio</u> | X | X | X |
| Great Grey Shrike | <u>Lanius excubitor</u> | X | | |
| Black-Headed Shrike | <u>Lanius schach</u> | X | | X |

| | | Wakhan Valley | Big Pamir | Small Pamir |
|-----------------------------------|--------------------------------------|------------------|--------------|----------------|
| <u>Accentors</u> | <u>Prunellidae</u> | | | |
| Himalayan Accentor | <u>Prunella himalayana</u> | | X | X |
| Brown Accentor | <u>Prunella fulvescens</u> | | X | X |
| <u>Warblers</u> | <u>Sylviidae</u> | | | |
| Barred Warbler | <u>Sylvia nisoria</u> | X | | |
| Greenish Warbler | <u>Phylloscopus trochiloides</u> | X | X | X |
| Chiffchaff | <u>Phylloscopus collybita</u> | X | | |
| Yellow-Browed Warbler | <u>Phylloscopus inornatus</u> | X | | X |
| <u>Thrushes, Chats and Allies</u> | <u>Turdidae</u> | | | |
| Stonechat | <u>Saxicola torquata</u> | X | X | |
| Wheatear | <u>Oenanthe oenanthe</u> | X | X | |
| Desert Wheatear | <u>Oenanthe deserti</u> | X | X | X |
| Isabelline Wheatear | <u>Oenanthe isabellina</u> | | X | |
| Red-Tailed Wheatear | <u>Oenanthe xanthopyrma</u> | | X | |
| White-Capped Redstart | <u>Chairmarrornis leucocephalus</u> | X | | |
| Black Redstart | <u>Phoenicurus ochrures</u> | X | X | X |
| Guldenstadt's Redstart | <u>Phoenicurus erythrogaster</u> | X | X | X |
| Eversmann's Redstart | <u>Phoenicurus erythronotus</u> | X | | |
| Redstart | <u>Phoenicurus phoenicurus</u> | | X | X |
| Bluethroat | <u>Luscinia svecica</u> | X | X | X |
| Black-Throated Thrush | <u>Turdus ruficollis atrogularis</u> | X | | |
| <u>Tits</u> | <u>Paridae</u> | | | |
| Willow Tit | <u>Parus montanus</u> | X | | |
| <u>Nuthatches</u> | <u>Sittidae</u> | | | |
| Eastern Rock Nuthatch | <u>Sitta tephronota</u> | X | | |
| Wall Creeper | <u>Tichodroma muraria</u> | X | X | |

| | | Wakhan Valley | Big Pamir | Small Pamir |
|-----------------------|---------------------------------------|------------------|--------------|----------------|
| <u>Dippers</u> | <u>Cinclidae</u> | | | |
| Dipper | <u>Cinclus cinclus</u> | X | X | X |
| Brown Dipper | <u>Cinclus pallasii</u> | | X | |
| <u>Buntings</u> | <u>Emberizidae</u> | | | |
| Corn Bunting | <u>Emberiza calandra</u> | | X | |
| Rock Bunting | <u>Emberiza cia</u> | X | X | X |
| Grey-Necked Bunting | <u>Emberiza buchanani</u> | X | | |
| Snow Bunting | <u>Plectrophenax nivalis</u> | | | X |
| <u>Finches</u> | <u>Fringillidae</u> | | | |
| Crimson-Winged Finch | <u>Rhodopechys sanguinea</u> | X | | |
| Twite | <u>Acanthis flavirostris</u> | | X | |
| Red-Fronted Serin | <u>Serinus pusillus</u> | X | | |
| Common Rosefinch | <u>Carpodacus erythrinus</u> | X | | |
| Great Rosefinch | <u>Carpodacus rubicilla</u> | X | X | |
| Brandt' Rosefinch | <u>Leucosticte brandti pamirensis</u> | | X | X |
| Hodgson's Rosefinch | <u>Leucosticte nemoricola</u> | X | X | |
| <u>Sparrows</u> | <u>Ploceidae</u> | | | |
| Tree Sparrow | <u>Passer montanus</u> | X | X | |
| House Sparrow | <u>Passer domesticus</u> | X | X | X |
| Snowfinch | <u>Montifringilla nivalis</u> | X | X | X |
| <u>Starlings</u> | <u>Sturnidae</u> | | | |
| Starling | <u>Sturnus vulgaris</u> | | X | X |
| Rose-Colored Starling | <u>Sturnus roseus</u> | X | | |

| | | Wakhan Valley | Big Pamir | Small Pamir |
|----------------|--------------------------------|------------------|--------------|----------------|
| <u>Orioles</u> | <u>Oriolidae</u> | | | |
| Golden Oriole | <u>Oriolus oriolus</u> | X | | |
| <u>Crows</u> | <u>Corvidae</u> | | | |
| Magpie | <u>Pica pica</u> | X | X | |
| Chough | <u>Pyrrhocorax pyrrhocorax</u> | X | X | X |
| Raven | <u>Corvus corax</u> | X | X | X |



Figure 2. The Aksu Valley in the Afghan Small Pamir. Lake Chagmatin lies in the center of the valley at an elevation of 4020 m. Mountains in the background lie in the Soviet Union; those on the right border China.



Figure 3. The plain of the Pamir River in the Afghan Big Pamir. In the center is the lake Zor Kol which lies at an elevation of 4130 m. The mountains at left are in the Soviet Union.



Figure 4. Mountains of the Afghan - Soviet Small Pamir. Note the gentle, rolling topography and absence of glaciers (elevation ca. 4800 m).



Figure 5. Rugged mountains of the Afghan Small Pamir along the Chinese frontier (elevation at the interface of the mountains and Aksu Valley ca. 4200 m). Compare the character of the physiography with the mountains in Figure 4.

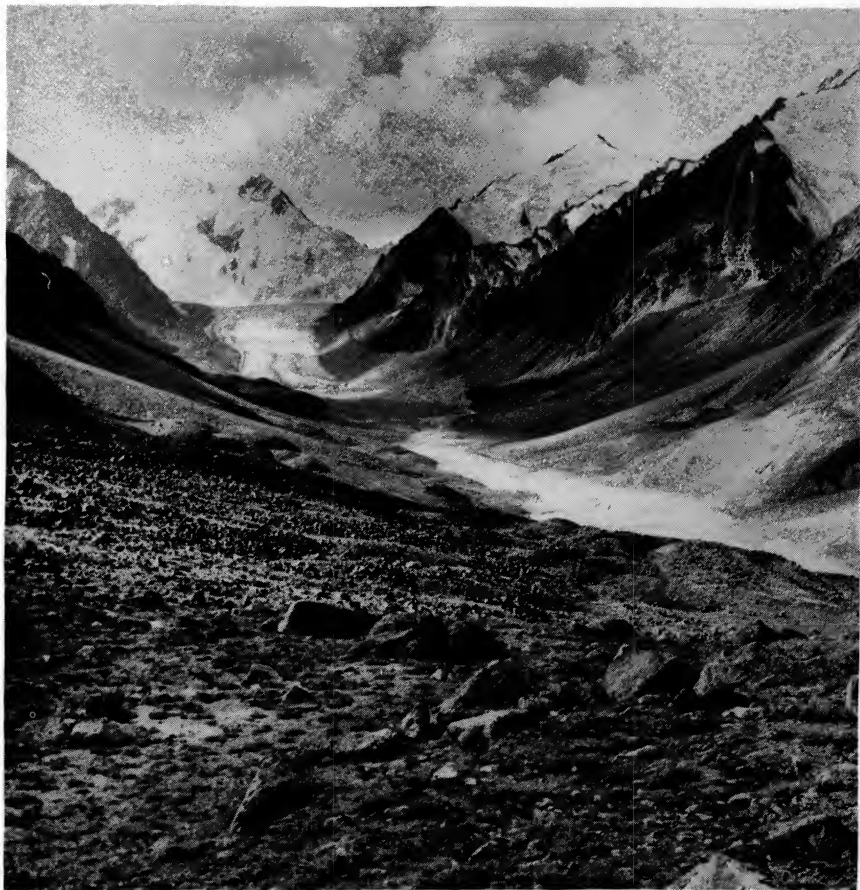


Figure 6. Typical glaciated valley of the Big Pamir. Shown here is Bai Tibet Valley.
The foot of the glacier lies at 4740 m elevation.

inability again being attributable to the width of the valley and the consequent absence of glaciers on any scale, and to the short summers, which do not last long enough or experience a sufficiently fierce sun to admit of a very powerful erosive impetus being communicated to melting snow" (Curzon, 1896). At the time, eight regions were distinguished as "Pamirs," among them the Aksu Valley (Figure 2) of the Afghan Small Pamir, and the Great Pamir of which the valley of the Pamir River and Lake Zor Kol form a part (Figure 3). The latter region is now recognized as a part of the Afghan Big Pamir. For convenience, the Small Pamir is defined in this report as containing the valley of the Aksu River including the mountains along its periphery on the Soviet and Chinese frontiers; the Big Pamir includes the Pamir River valley with the mountainous knot that lies between the Wakhan and Pamir rivers. It is in the mountainous and hilly regions bordering these "Pamirs" that Marco Polo sheep are most frequently found. These two Pamirs lie above 4000 m and contain mountains which rise above 6200 m. Both the Aksu and Pamir river valleys are broken by small hillocks with a relief of several hundred feet. Nearer to the main watercourses, the valleys are flat and moist, although their surfaces are frequently broken up by hummocks formed by alternate freezing and thawing in spring and summer months. Two large lakes, Chaqmatin and Zor Kol, are found in the Aksu and Pamir river valleys respectively. Glaciers are absent in the mountains of the Small Pamir bordering the Soviet Union (Figure 4), but occur along the more rugged peaks on the Chinese frontier (Figure 5).

A small icefield remains in the highest areas of the Big Pamir whose generally retreating glaciers spill out at the heads of tributary valley floors above 4600 m (Figure 6).

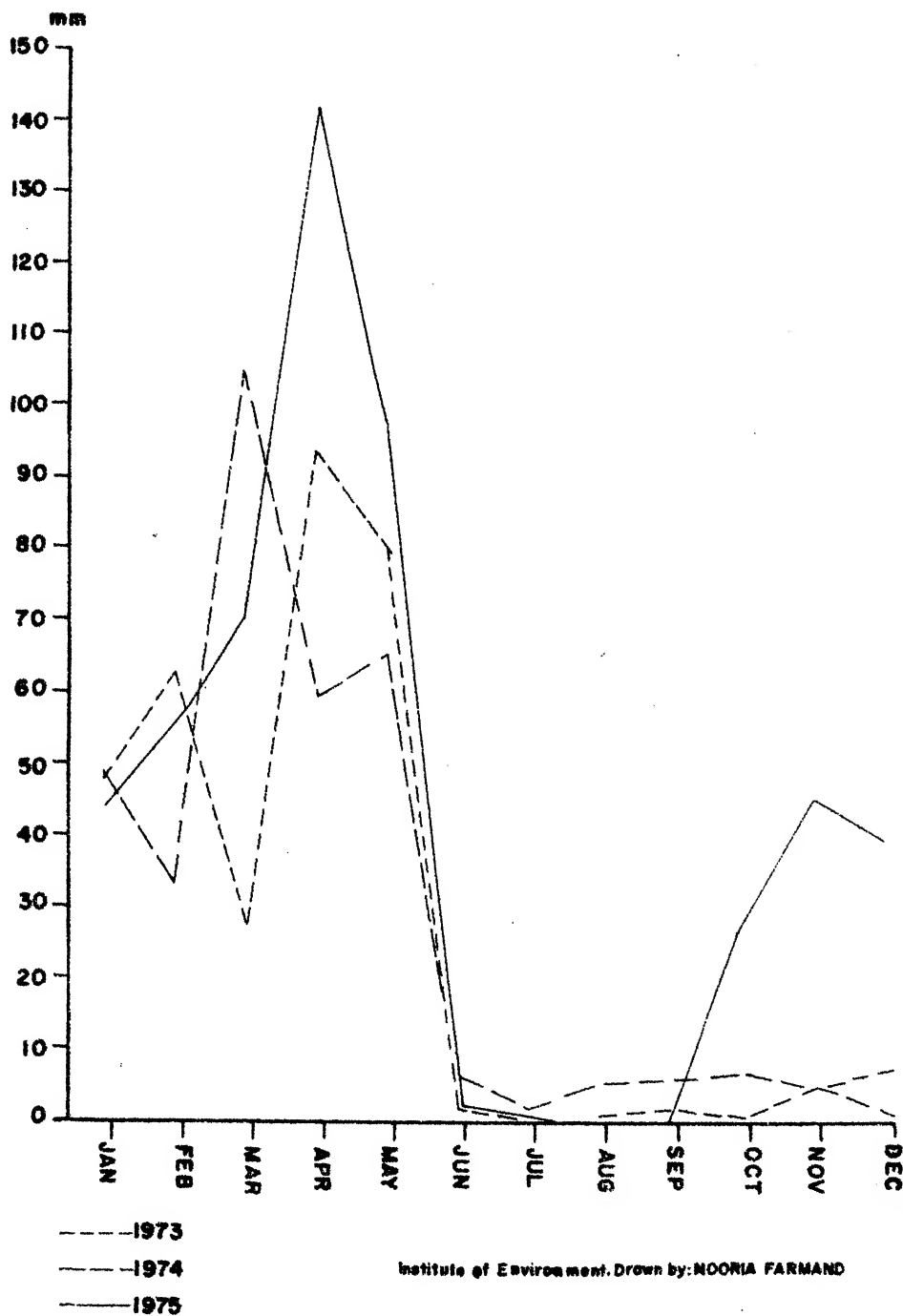


Figure 7. Mean monthly temperatures recorded in Faizabad, the provincial capital of Badakhshan for the years 1973 through 1975. Data courtesy of the Meteorological Institute, Kabul.

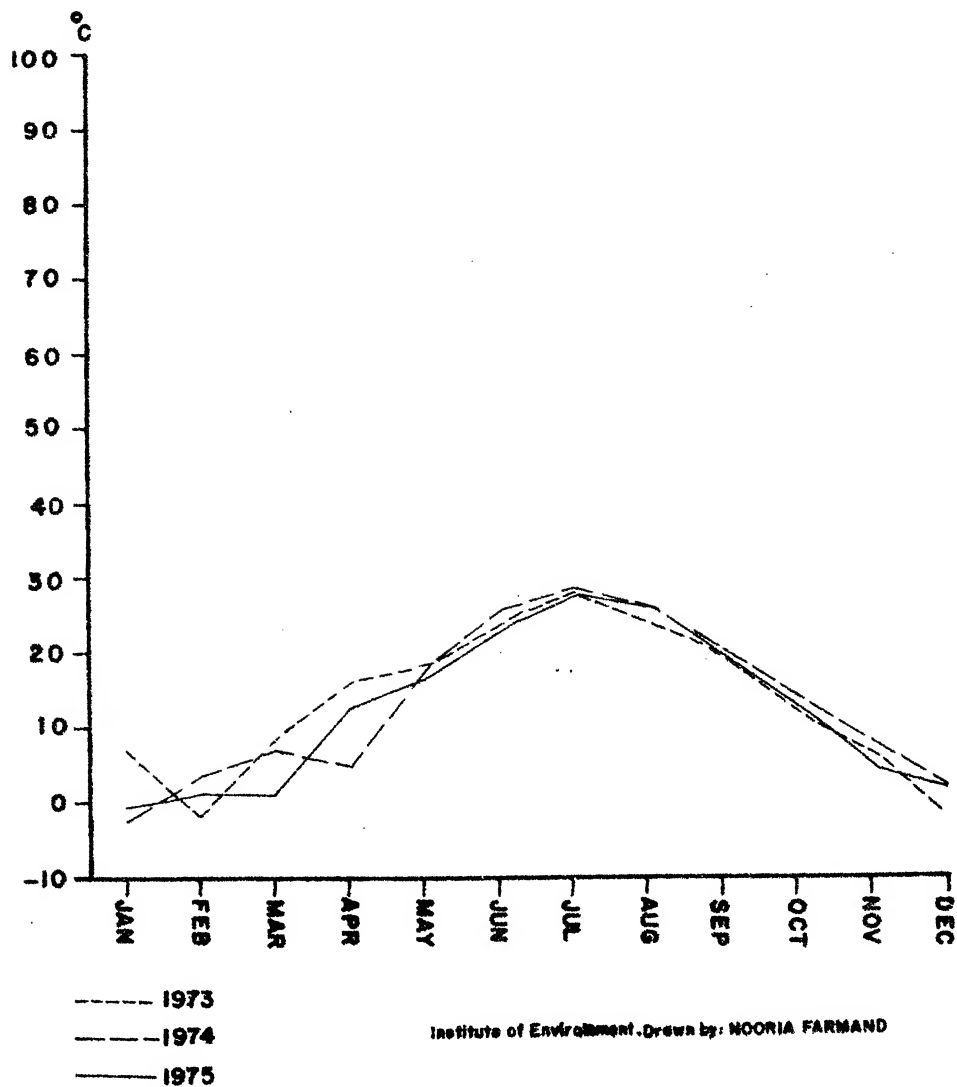


Figure 8. Mean monthly precipitation recorded in Faizabad, the provincial capital of Badakhshan for the years 1973 through 1975. Data courtesy of the Meteorological Institute, Kabul.

2.3. Geology

Geological reconnaissance and mineral exploration in the Wakhan Corridor have been carried out in recent years by Russian geologists. However, at the time of this writing, reports of these investigations were not readily available. The dominant country rock forming the mountains of the Wakhan are metamorphics and igneous intrusives. Erosion is largely of a mechanical nature rather than chemical. Frost shattering and heaving, glacial scouring and plucking, together with wind and stream erosion dominate landscape formation. The more xeric mountain slopes usually contain sandy soils that grade from or into coarse angular scree. Moist valley bottoms composed of an alluvium base contain shallow (10-40 cm) but widespread peat deposits which are sometimes exploited by local inhabitants to supplement their main fuel of animal dung. Disseminated deposits of tourmaline and other semi-precious silicates have been seen in situ in addition to iron and copper mineralization. Sulfurous hot springs emanating from igneous rocks can be found in both the Big and Small Pamirs. At the best localities, locals have erected stone shelters to serve as bath houses which can be freely used by anyone in the vicinity. White, powdery encrustations of magnesium (?) overlies desiccated areas of intermittent lakes and ponds exhibiting a frost-like appearance that can be seen at a distance glistening in the sun. The landscape somewhat resembles the alpine areas of northern Scandinavia, and is probably reminiscent of the periglacial environment which characterized Alaska and Siberia during the late Pleistocene (Matthews, 1975).

2.4. Climate

Meteorological data are all but absent from the Afghan Pamir. The nearest government weather station is located at the provincial capital in Faizabad. The mean monthly temperatures and precipitation data collected at this station during 1973-74-75 are summarized in Figures 7 and 8, and at best should only be

considered an approximate trend to those which actually occur in the Pamir proper. However, Figure 7 shows that warmest temperatures occur during the months of June, July and August, which can also be correlated with the period of lowest precipitation (Figure 8). This trend is believed analogous to the situation in the Pamir. The highest precipitation in Faizabad occurs largely in the form of rain during the months of March, April and May. In the Pamir, however, snow accumulation begins towards the end of October, probably peaks in late January to early February, then falls off towards the end of March.

Snow is by and large the most important form of moisture for Pamir rangeland. For six or seven months of the year the entire region remains covered with snow, although there is considerable variability in snow depth from year to year. In any given year there is also extreme variability in snow cover from one area to another. According to local people, several meters may accumulate in valleys of the Big Pamir while much of the Aksu Valley in the Small Pamir may only retain several centimeters, the bulk being blown away by strong south-west winds. In most areas, snow begins to fall by late September or early October, and by November all high passes (i.e., above 4500 m) are closed until late April or May. Fortunately the main track along the Wakhan River remains open year-round, which allows residents to reach grain supply centers at Qala-i-Panja and Khundud. During the winter of 1974-1975, an average of 12 to 15 cm covered the Ortobil Pass area in the Small Pamir. Range conditions in that area during 1975 were poor because of insufficient moisture. The next year, 1975-76, over one meter of snow covered most of the Aksu Valley, causing widespread mortality (over 50%) among domestic stock. Range conditions in 1976 were excellent according to the Kirghiz inhabitants, yet many people having lost all their animals were forced to leave the Small Pamir and seek employment as laborers in places such as Khundud, 250 kms. away. The overall severity of the climate, particularly in winter, makes the region one of the least

hospitable in the country. Coupled with its remoteness and elevation, the climate has been a major factor which has restricted travel, affected the health of the human population, limited educational facilities, and impeded the overall integration of the Wakhan Corridor into the rural economy of Badakhshan.

2.5. Water

The major river systems of the Wakhan Corridor are as follows:

- a) the Pamir River flows westward and drains the lake Zor Kol on the Afghan-Russian frontier. It also drains river valleys of the Big Pamir knot of Afghanistan and those of the Soviet Union;
- b) the Aksu River (Darya Aksu) which flows eastward from Lake Chaqmatin and eventually joins up with the Pamir River in the Soviet Union;
- c) the Waghjir River (Darya Waghjir) which drains the mountain tributaries of the Waghjir Valley bordering China and Pakistan and flows in a north-westerly direction until it joins the Darya Bozai Gumbaz to form the Darya Wakhan;
- d) the Wakhan River (Darya Wakhan or Ab-i-Wakhan) which flows westward for about 105 kms from Bozai Gumbaz in the Small Pamir and drains mountains of the Pamir and Hindu Kush ranges; it joins the Pamir River near the outpost of Gaz Khan forming the Darya Panj (Ab-i-Panja).

Curzon (1896) established the source of the Oxus River as emanating from an unnamed glacier near the head of the Waghjir Valley, thus correcting Wood (1841) who had earlier claimed its source to be the Zor Kol (Lake Victoria) in the Pamir-i-Kalan (Great or Big Pamir). In any event, all the rivers draining the Wakhan eventually join up to form the main part of the

Darya Panj which further downstream is called the Amu Darya or Oxus River. All the rivers emanating from the Wakhan are glacially derived but are supplemented by waters of melting snow in the spring and summer. High water level occurs during July and August and can hinder travel in a few local areas. During winter, however, water supply is dramatically reduced, and in the Corridor, stream channels become major travel roads.

Fresh spring water is not uncommon, and where found is preferred over glacial water consumption by residents. However, during winter, most of these springs freeze over and many people, particularly those residing in the Aksu Valley, must melt snow for their basic needs. The lack of calcium and other mineral salts in the glacial water has left all but few residents with bad teeth and even some with goiters.

3. THE BIOTIC ENVIRONMENT

3.1. Flora

The flora of the high Pamir belongs to the alpine vegetation community mentioned by Freitag (1971). Breckle (1971) has discussed some examples of floristic composition and ecological factors of alpine vegetation in Afghanistan, and Anders (1973, pers. comm.) is compiling a list of the Afghan Pamir vegetation. Skogland and Petocz (1975) discussed habitat utilization by Marco Polo sheep in winter, but plant identifications made then were incomplete because of prevailing conditions. Taken together, alpine vegetation types in the whole of the country have been only marginally studied.

Specimens collected by the author in the Tulibai Valley of the Big Pamir Reserve in August 1976 are included in Table 1 and are divided into five habitat types which are described below.



Figure 9. Luxuriant sedge meadows dominated by Carex and Kobresia covering the valley bottom of Sargaz Valley in the Big Pamir Wildlife Reserve (elevation at lake 4494 m).



Figure 10. Typical alpine steppes on the mountain slopes of Sargaz Valley in the Big Pamir Wildlife Reserve (elevation at valley bottom 4202 m). About 200 domestic sheep and goats can be seen grazing, center.



Figure 11. Alpine steppes in the lower part of the Big Pamir Wildlife Reserve (elevation ca. 4100 m). Compare the sparsity of vegetation with that in Figure 10. The stacked Marco Polo sheep horns serve as a trail marker.



Figure 12. Alpine heaths dominated by *Primula macrophylla* on the valley rim overlooking Abakhan Valley in the Big Pamir Wildlife Reserve (elevation ca. 4900 m).



Figure 13. Sparsely vegetated rubble slopes in the Jaman Sor region of the Small Pamir (elevation ca. 5000 m).

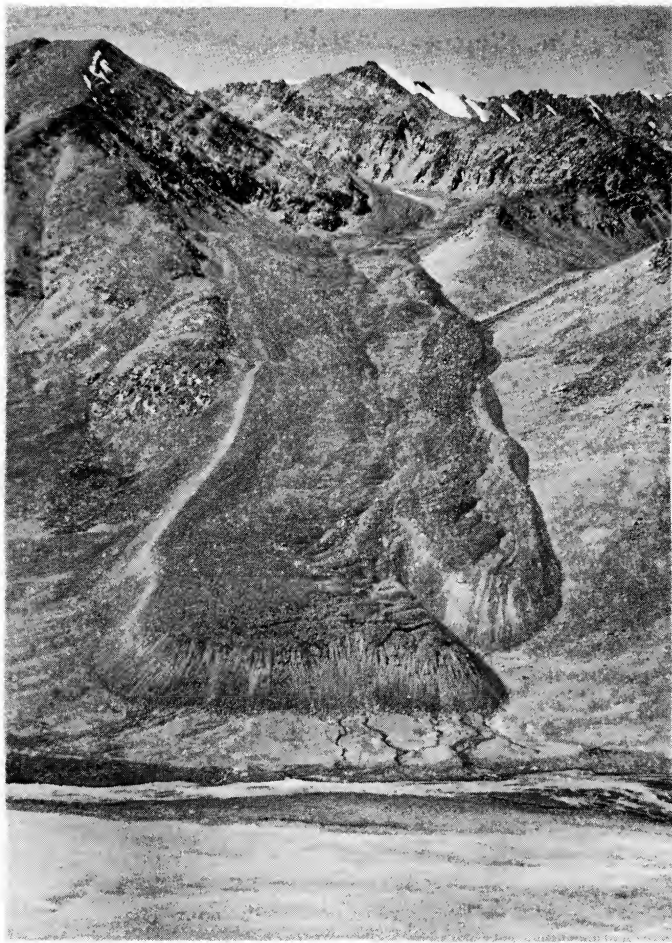


Figure 14. Tongue of coarse scree forming the rock glacier in Darya Warm in the Big Pamir (elevation at the foot of the scree slope is ca. 4200 m). The scree is practically devoid of vegetation.

- 1) Sedge Meadows: This habitat is formed on well-watered flats, depressions or breaks occurring on more xeric surrounds with the most extensive development being on the bottoms of tributaries and major valleys. These luxuriant meadows are dominated by the sedges Kobresia and Carex which in many localities grow along a hummocky surface overlying peat deposits, the product of decaying sedge plant material (Figure 9). The sedge meadows are one of the characteristics of Curzon's (1896) definition of "Pamir" and are found throughout the region between elevations of 4000 to 5000 m.
- 2) Alpine Steppes: One of the most common habitat types found in the Pamir region, alpine steppes occur on mountain slopes of all aspects where more xeric conditions predominate (Figures 10 and 11). The most conspicuous genera present are Artemisia, Acantholimon, Acanthophyllum, Nepeta, Hedysarum, Festuca, and species of the family Poaceae. Cousinia is also locally common. This habitat is found in the Wakhan Valley below 3100 m and occurs up to elevations of 4600 m. In many localities bare ground, rock, and gravel comprise more than 50% of ground area.
- 3) Alpine Heaths: This habitat occurs on the table-land and rim above valleys, as well as on the wet, gravelly areas near glaciers. These sparsely vegetated areas are dominated by species of Festuca, Primula macrophylla, Poa, Carex and such pioneer species as Waldheimia and Saxifraga. Here bare ground, rock and gravel make up between 40 and 50% of the ground area. The habitat generally occurs above 4300 m elevation (Figure 12).
- 4) Rubble Slopes and Scree: Because of its location at very high elevations and its extensive ground area comprised only of rock or gravel, this habitat supports limited vegetation which usually occurs in scattered clusters (Figures 13 and 14). The most conspicuous plants in the habitat include species of the family Compositae. While scree are found at most elevations, gravel slopes only occur at higher elevation above 4300 m.

5) Gulleys: This habitat occurs at slope breaks and is the product of stream erosion, intermittent water rivulets, or springs draining downslope perpendicular or oblique to the main valley axis. In the resultant gulley zone there occurs a complex of vegetation of both hydric and xeric types depending upon their proximity to the stream. The habitat occurs at all elevations on mountain slopes, but most frequently between 4000 and 4500 m.

Based on specimens collected in the Tulibai Valley of the Big Pamir Wildlife Reserve in August 1976, the most conspicuous plants in each of the five habitats recognized are listed in Table 1 below. I am indebted to Dr. S.W. Breckle of the Institute of Pharmacology, Bonn University who provided most of the identifications of the species mentioned. It should, however, be emphasized that although the basic habitat types occur throughout the Afghan Pamir, there most certainly will be variations in the plant community at the species and sub-species level from the Big to the Small Pamir as result of geography, altitude and slope exposure.

ABSTRACT

This report is the first part of a three-part study of the Pamir Region. It contains a discussion of the physical environment, including physiography, geology, climate and water. A discussion of the fauna and flora of the region is provided and lists of mammals and birds of the area are included. The herpetofauna is discussed and all known occurrences of amphibians and reptiles in the Pamir mentioned. Cultural resources of the entire region are discussed with respect to archaeology and the present human environment.



REPORT ON THE AFGHAN PAMIR

PART 1: ECOLOGICAL RECONNAISSANCE



FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS



Cover: Petroglyph from the Waghjir Valley depicting an ibex. Actual size of the etching is about 80 mm (body length). Photo by R.G. Petocz.

National Parks and Utilization of Wildlife Resources

A F G H A N I S T A N

REPORT ON THE AFGHAN PAMIR

Part 1: Ecological Reconnaissance

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UNITED NATIONS DEVELOPMENT PROGRAMME
FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
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TABLE OF CONTENTS

ABSTRACT

| | |
|--|----|
| 1. INTRODUCTION | 1 |
| 2. THE PHYSICAL ENVIRONMENT | 2 |
| 2.1. Location | 2 |
| 2.2. Physiography | 2 |
| 2.3. Geology | 4 |
| 2.4. Climate | 4 |
| 2.5. Water | 6 |
| 3. THE BIOTIC ENVIRONMENT | 7 |
| 3.1. Flora | 7 |
| 3.2. Fauna | 12 |
| 3.2.1. Mammals | 12 |
| 3.2.2. Birds | 17 |
| 3.2.3. Amphibians, reptiles and fish | 18 |
| 4. CULTURAL RESOURCES | 20 |
| 4.1. Archaeology | 20 |
| 4.2. Present human environment | 22 |
| 5. REFERENCES | 24 |
| Appendix I. Birds of the Afghan Pamir and Wakhan Valley | 27 |

FIGURES

1. Location map of the Wakhan Corridor and the Pamir Mountains.
2. The Aksu Valley in the Afghan Small Pamir.
3. The plain of the Pamir River in the Afghan Big Pamir.
4. Mountains of the Afghan-Soviet Small Pamir.
5. Rugged mountains of the Afghan Small Pamir along the Chinese frontier.
6. Typical glaciated valley of the Big Pamir.
7. Mean monthly temperatures recorded in Faizabad, the provincial capital of Badakhshan, for the years 1973 through 1975.
8. Mean monthly precipitation recorded in Faizabad.
9. Luxuriant sedge meadows dominated by Carex and Kobresia covering the valley bottom of Sargaz Valley in the Big Pamir Wildlife Reserve.
10. Typical alpine steppes on the mountain slopes of Sargaz Valley in the Big Pamir Wildlife Reserve.
11. Alpine steppes in the lower part of the Big Pamir Wildlife Reserve.
12. Alpine heaths, dominated by Primula macrophylla, on the valley rim overlooking Abakhan Valley in the Big Pamir Wildlife Reserve.
13. Sparsely vegetated rubble slopes in the Jaman Sor region of the Small Pamir.
14. Tongue of coarse scree forming the rock glacier in Darya Warm in the Big Pamir.
15. Streamside shrub community along the Wakhan River near the village of Ab Gaj.
16. A major site of petroglyphs in the Waghjir Valley.
17. Petroglyph from the Waghjir Valley site, depicting wild yak.
18. Petroglyph from the Waghjir Valley site depicting human figures with three pronged spears in pursuit of an ibex.

19. Enlargement of the hunters shown in Figure 18.
20. Old Kirghiz graves (gumbaz) at Qabrestani Ortobil in the Aksu Valley, Small Pamir.
21. Division of the traditional territories of Wakhi and Kirghiz people in the Afghan Pamir.

TABLES

1. Plant composition of five alpine habitat types recognized in the Pamir region.
2. Mammalian fauna of the Wakhan Corridor.
3. Partial census of Siberian ibex in the Pamir.

Photographs: R.G. Petocz